Decomposition Descent Method for Limit Optimization Problems

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Abstract. We consider a general limit optimization problem whose goal function need not be smooth in general and only approximation sequences are known instead of exact values of this function. We suggest to apply a two-level approach where approximate solutions of a sequence of mixed variational inequality problems are inserted in the iterative scheme of a selective decomposition descent method. Its convergence is attained under coercivity type conditions.

Keywords: Optimization problems · Limit problems · Non-smooth functions · Mixed variational inequality · Decomposition descent method · Coercivity conditions

1 Introduction

We first consider the general optimization problem, which consists in finding the minimal value of some function p over the corresponding feasible set X. For brevity, we write this problem as

$$\min_{\mathbf{x}\in X} \to p(\mathbf{x}). \tag{1}$$

Its solution set will be denoted by X^* and the optimal value of the function by p^*, i.e.

$$p^* = \inf_{\mathbf{x}\in X} p(\mathbf{x}).$$

In order to develop efficient solution methods for this problem we should exploit certain additional information about its properties, which are related to some classes of applications.

In what follows, we denote by $\mathbb{R}^s$ the real s-dimensional Euclidean space, all elements of such spaces being column vectors represented by a lower case Roman alphabet in boldface, e.g. $\mathbf{x}$. For any vectors $\mathbf{x}$ and $\mathbf{y}$ of $\mathbb{R}^s$, we denote by $\langle \mathbf{x}, \mathbf{y}\rangle$ their scalar product, i.e.,

$$\langle \mathbf{x}, \mathbf{y}\rangle = \mathbf{x}^\top \mathbf{y} = \sum_{i=1}^{s} x_i y_i,$$

R. Battiti et al. (Eds.): LION 2017, LNCS 10556, pp. 166–179, 2017.
https://doi.org/10.1007/978-3-319-69404-7_12